

## High Voltage Power Lines: Do They Affect Residential Property Value?

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**Abstract** A survey administered in 1990 suggests that proximity to high voltage power lines is being capitalized into lower values for residential properties. Respondents who had appraised such property report that power lines can affect residential property value to varying degrees under certain circumstances and that the market value of these properties is, on average, 10.01% lower than the market value for comparable properties not subject to the influence of high voltage power lines. Further, the results indicate that even appraisers who had not appraised such property believe that power lines contribute negatively to property value.

### Introduction

The popular press and recent articles in the academic literature [5], [6] underscore a dramatic shift in perception regarding the value of residential property located proximate to high voltage electric power lines. It is commonly believed that power lines impose a significant negative impact on the desirability, hence the value of, housing stock adjacent to or within a short distance of the lines. This perception is in stark contrast to the preponderance of research dating from the mid-1950s to the late 1980s which found no or negligible impact on property values from power lines [17]. The most commonly cited reason for this shift is the potential health hazards detailed in epidemiological studies claiming a positive correlation between long-term exposure to the electromagnetic fields produced by power lines and certain types of cancers in humans [12], [13], [19]. While no study to date has proved conclusively that a health hazard exists, the ongoing debate poses an interesting question for researchers in the field of valuation. Specifically, is the perception that residential property is negatively affected by proximity to power lines based on reality, i.e., changes in the market for such properties, or is it simply a belief unsubstantiated by market evidence. If appraisers are penalizing properties located near power lines, but this penalty is not substantiated by market evidence, then there is, indeed, cause for concern.

To address the question of whether high voltage overhead electric transmission lines (HVOETLs) result in a lower market value for residential property located adjacent to or within sight of (proximate to)<sup>1</sup> the lines, a survey of appraisers holding the RM designation was conducted in 1990. This survey questioned appraisers who have

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Date Revised: October 1992; Accepted: October 1992.

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experience appraising residential property proximate to HVOETLs, as well as appraisers having no experience appraising such property.

One of the objectives of this study was to determine, based on the responses of experienced appraisers, whether the market value of affected properties was significantly lower than the market value of comparable properties not affected by HVOETLs. If this is indeed true, and given the sales comparison approach is used most often to value residential property, this would imply that the actual sale prices of dwellings proximate to HVOETLs are lower than for comparable properties not in proximity to HVOETLs.

The second objective was to compare responses of appraisers having experience with this type of valuation assignment to the responses of appraisers without experience to determine if the value conclusions were significantly different. From this it could be determined whether the value conclusions regarding the consequences of proximity to HVOETLs (the estimated magnitude of the value impact) were different between the two groups.

## Literature Review

There is a significant and varied body of literature focusing on the potential impact of HVOETLs on different property types. Almost all of the research reported in the literature to date has concluded that HVOETLs have little or no effect on property value. Kinnard [17] reports on more than seventy-five studies and articles (published and non-published) from the mid-1950s to 1988, that seek to determine what, if any, effect HVOETLs have on sale prices and market values of nearby real property. The studies cited examine improved residential property (the focus of this study), vacant land, including acreage and lots in subdivisions, but excluding agricultural land that is actively farmed, and all other land uses, including actively farmed land.

In addition to categorizing studies by type of property, Kinnard [17] further classifies the literature reviewed by date (pre-1970 or post-1970), topic (studies that focused on economic value versus non-monetary issues such as physical, health, and psychological effects of proximity to HVOETLs), and methodology used. These latter studies rely primarily on statistical models, direct comparisons of groups of sales, case studies and mini-appraisals, and judgmental and non-empirical studies, including those that rely on questionnaires.

Four studies used statistical models to determine if HVOETLs had a measurable impact on proximate residential real estate. Three out of the four reported little or no discernible impact (Blinder [2]; Brown [3]; Kinnard, Geckler, Geckler, Kinnard and Mitchell [8]).<sup>2</sup> The lone dissenting study reporting a significant negative impact on value is that of Colwell and Foley [5]. More recently, another study by Colwell [6], not included in the Kinnard bibliography [17], finds a negative impact on residential properties in close proximity to power lines, declining as distance increases.<sup>3</sup> Further, the negative impact diminishes with time. Colwell [6] also determines that properties not adjacent to, but within sight of, a utility easement suffer an impact as a result of proximity to power lines.

Two studies used paired sales analyses and direct comparison. Neither study detected any negative impact on residential property value (Canadian Real Estate Research Corporation, Ltd. [4] and Realty Research Group, Ltd. [14]). Six case studies or

mini-appraisals were analyzed with none of the six finding any measurable impact on value (Lamprey [9]; Realty Research Group, Ltd. [14]; Commonwealth Edison [7]; Minnesota Power [11]; Sherman [16]; and Vredenburg [18]).<sup>4</sup> Finally, of the ten studies classified as non-empirical or judgmental, only two (Ball [1] and Layton [10]) appear to deal solely with the potential economic (value) affect of HVOETLs on proximate improved residential real estate. The remainder address noneconomic impacts. Neither the Ball [1] study nor that of Layton [10] conclude that proximity to HVOETLs adversely affects market value or sale price. The findings, regardless of study methodology, overwhelmingly support the conclusion that little or no significant negative effect exists on property values attributable to HVOETL proximity.

### **Study Justification**

Although conventional wisdom indicates that HVOETLs negatively impact residential property values, the majority of related research indicates otherwise. The issue is of importance not only to property owners, but fee appraisers, tax assessors, mortgage underwriters, insurers, and others directly or indirectly involved with valuation. Specifically, is the valuation process being influenced by perception or is there hard evidence that the market is indeed valuing properties proximate to HVOETLs lower than comparable properties not so affected.

### **Study Hypothesis**

It is hypothesized that there is no difference in the value conclusions of appraisers who have appraised residential properties proximate to high voltage power lines compared to appraisers who have not appraised such property. Alternatively, appraisers who have appraised such properties will differ in their conclusions regarding the value adjustment warranted when compared to appraisers who have not appraised such property. It is assumed that professionals having experience in appraising properties proximate to HVOETLs will report their conclusions based on market evidence. Appraisers not having such experience are assumed to report their conclusions based on other evidence, different from that used by experienced appraisers.

### **Sample Group Profile**

The survey was conducted in cooperation with personnel in the Research Department of the Appraisal Institute.<sup>5</sup> The Appraisal Institute was responsible for mailing out the questionnaire to a random sample of Appraisal Institute members holding the RM designation. The initial mailing was sent to 500 potential respondents. Based on previous survey research by the Appraisal Institute, a 50% response rate was anticipated from the initial mailing.<sup>6</sup> (The goal was to obtain a sample size sufficient to establish a 95% confidence level on the data analysis with a maximum bound on the error of 5%.) A cover letter encouraging each survey recipient to participate in the study also was included in the mailing. Of the 500 questionnaires mailed out, 53.6% (268) were

returned. Of these, 49 were eliminated because of conflicting responses leaving a 43.8% usable response rate  $[(268-49)/500 = 43.8\%]$ . Appraisers holding the RM designation from forty-seven states and Puerto Rico participated in this study. Sixty-four percent of those responding indicated they held the RM designation only, while the remaining 36% held two or more professional designations.<sup>7</sup>

## Survey Design

The survey was designed to fit on both sides of one 8.5 by 14 inch page. (The Appendix presents the survey instrument.) Past research has shown a one-page survey to be preferable to a multi-page instrument in that potential respondents will be more likely to participate if they believe the time commitment to complete the survey is not excessive. This survey was designed to take no more than ten minutes to complete. A self-addressed and stamped envelope was included with the cover letter and questionnaire.

## Results

Of the 219 usable responses to question 1, 84.0% of respondees indicated that the market value of residential property is negatively affected when located proximate to HVOETLs. In response to question 2, which asks, "How much, on average, is property value decreased?," the mean value decline was 10.2% with a standard error of .49.<sup>8</sup> Given the definition of proximate in the survey introduction, it is assumed that when a value range was noted by a respondent, the lower bound refers to the decline in the value of properties within sight of HVOETLs, while the upper bound refers to properties adjacent to HVOETLs. This would imply, as Colwell [6] found, that the negative impact due to HVOETLs declines with distance from the power lines. Alternatively, respondents could be indicating that proximity affects residential properties dissimilarly depending on such variables as: relative price of the subject; market supply and demand factors influencing the subject; quality of right-of-way maintenance; buffers; media exposure of potential health dangers; etc.

Depending on a respondent's answer to question 14, which asks, "In what state(s) do you do most of your appraisals?," and provided that individual had appraised property proximate to HVOETLs (from question 8), the responses to question 2 were grouped into eight geographic regions (Exhibit 1).

Exhibit 1 reveals that in seven of the eight regions, the mean decline in value ranges from 7.77% to 12.5%, with an average decline for all regions of 10.03% with a standard error of .51. The notable exception is New England, where the mean decline is 15.5% or almost twice that noted in the Midwest. While the number of responses from New England is insufficient to establish statistical significance, the considerable geographic variation in the estimated value decline is, indeed, of interest.

One possible explanation for this greater average decline could be higher public awareness of environmental issues. Another possible reason may be the population density in several of the New England states. In densely populated areas more properties are likely to be affected by HVOETLs than in states that are less densely populated. The

**Exhibit 1**  
**Regional Analysis of the Mean Percentage Decline and Range of Decline**  
**in Residential Property Value Due to HVOETL Proximity**

Region	Mean Decline in Value	Range of Decline
Midwest	7.77 (41)	0-25
West Coast	9.79 (19)	2-25
S. Central	10.63 (27)	0-50
Rocky Mts.	10.94 (08)	0-25
Southeast	10.70 (34)	0-50
Mid-Atlantic	10.88 (21)	0-25
Plains	12.50 (03)	2-20
New England	15.50 (05)	5-20
All Regions	10.03 (158)*	0-50

where ( ) is the number of responses by region.

\*The number of responses does not total 166 (219 usable responses less the 35 responses of those indicating that HVOETLs did not negatively affect residential property value less the 18 responses of those who thought a negative effect was warranted but had no experience) because eight respondents failed to indicate the state in which they did most of their appraisals.

Source: Authors

more people that are potentially affected, the greater the public voice demanding accountability from entities responsible for construction and maintenance of HVOETLs.

A further analysis of the responses given by participants who had appraised property proximate to HVOETLs and who believed that this proximity resulted in a negative effect was done using experience level as the means of categorizing responses. Of the 166 experienced respondents who concluded that value is negatively affected by HVOETLs, only 159 provided an estimate of the average percentage decline as well as indicating the number of years they had been in the appraisal business (from question 11). From Exhibit 2, it does not appear that the experience level of the respondent who had appraised property proximate to HVOETLs influences the estimate of the value decline.

Of the thirty-five respondents indicating HVOETLs had NO impact or POSITIVE

**Exhibit 2**  
**Mean Value Decline by Experience Level**

No. of Years in Profession*	Mean Value Decline
5 to 10 years (41)	9.5%
11 to 15 years (57)	9.24%
More than 15 years (59)	10.59%

\*less than five years omitted because only two respondents fell into this category

Source: Authors

impact on proximately located residential property, twenty-two individuals (10%) indicated that HVOETLs have no discernible impact on value. Thirteen respondents (6%), however, indicated HVOETLs impart a positive impact on value.

The reason most commonly given for a positive effect was the existence of larger yards which generated more privacy for owners. It was not possible to determine from the responses whether a dwelling proximate to HVOETLs and situated on a larger lot commanded a higher price than for a comparable dwelling situated on a standard size lot not subject to the influence of HVOETLs. If no price premium is paid for the dwelling with a larger lot then, indeed, a negative effect on value should be attributed to the electric transmission line as the larger lot is simply masking the effect of the power line.

### What Contributes to the Decline in Value?

Survey participants who believed HVOETLs had a negative impact on property values were instructed to cite reasons for the value decline. Four specific choices were listed in the survey. Exhibit 3 clearly demonstrates that the most often cited factor is the visual unattractiveness of the power lines with concerns regarding potential health hazards second and disturbing sounds and safety concerns third and fourth, respectively.

Thirty respondents (13.7%) indicated there were other factors contributing to a decline in property value when situated near HVOETLs. Of these, thirteen persons felt that HVOETLs had a negative influence on value because of electrical interference with television and radio reception. Seven appraisers indicated that the power lines lessened

**Exhibit 3**  
**Reasons Cited for Decline in Value Due to HVOETL Proximity**

Reason	Percent of Respondees Citing
Visually unattractive	93.9
Health problems	58.9
Disturbing sound	43.1
Unsafe	28.6
Other	14.0

Source: Authors

**Exhibit 4**  
**What Actions are Taken by Builders, Developers, or Sellers to Offset Negative Effects of HVOETLs?**

Action	Percent of Respondees Citing
Lower price	68.5
Larger lot size	58.0
Buffers/landscaping	48.7
Other	8.0

Source: Authors

the utility of the property. This apparently was more of a concern when the HVOETLs ran along the boundary of the property. Other factors mentioned were that the rights-of-way allowed unauthorized entry to the property and the rights-of-way were not well maintained by the utility company.

Respondents who believed HVOETLs had a negative impact were instructed to indicate what actions they had observed implemented by builders, developers, or sellers designed to offset any such negative effects. From Exhibit 4 it can be seen that appraisers most often noted lower sale prices, larger lots, landscaping and buffering as remedies for proximity to the power lines.

There were seventeen responses (7.8%) to the Other category in Exhibit 4. Five respondees noted builders were simply avoiding the power lines and building further away from them. This would seem to indicate an additional cost in idle land that formerly would have been developed. Of course, builders and developers may be passing the cost back to the landowner in the form of lower bid prices. Another five participants said that the visual impact was mitigated by placing electrical power lines underground or by rerouting them away from developments.<sup>9</sup> Two respondees mentioned that builders were erecting fences along the right-of-way to partially block the view and as a safety measure to keep small children from wandering into the right-of-way. The remaining responses indicate that builders, developers, and sellers were offering financing concessions as an inducement to buyers to purchase residences proximate to HVOETLs.

The appraisers were asked how many residential properties they had appraised in the last five years. A little more than 4% (ten respondees) had appraised no residential properties in the last five years. These individuals were instructed to go directly to question 16 where they were asked if they had any other comments about how HVOETLs affect the valuation of residential property. As Exhibit 5 indicates, the vast majority of those responding to the survey are active residential appraisers.

#### Exhibit 5 Residential Appraisal Experience and HVOETL Appraisal Experience

No. of Residential Appraisals during Past 5 Years	Percent of Respondees Citing
None	4.0
< 50	3.0
50-100	4.0
101-150	2.5
151-200	4.0
> 200	82.5
HVOETL Appraisal	Percent of All Residential Appraisals
None	11.0
< 10%	85.0
10-20%	2.5
> 20%	1.0

Source: Authors

Slightly more than 11% of those appraisers who indicated they had appraised residential properties, had never appraised a property proximate to HVOETLs. Eighty-five percent of respondents indicated that less than 10% of the residential appraisals they conducted were of properties proximate to HVOETLs. Only 3.5% of those surveyed indicated that more than 10% of their work was conducted on HVOETL proximate property.

### How Do Appraisers Measure the Impact of HVOETLs?

This question generated the widest range of responses of any question on the survey. The most frequently used method was matched pairs or paired sales analysis. This approach accounted for approximately 42% of all responses. Almost 27% of respondents indicated they compared properties proximate to HVOETLs with properties not proximate to HVOETLs. It is assumed that the comparison was of otherwise similar properties. Therefore, this method is really paired sales analysis, while not explicitly referenced as such. Thus, 69% of respondents used this method in determining the effect of HVOETLs on proximate residential real estate.<sup>10</sup>

Nine percent of respondents said they used public data, the market, or MLS to make comparisons. It is assumed that these respondents actually used these data to perform paired sales or matched sales analyses. Additionally, 7.5% of those surveyed felt that discussion with buyers, sellers, developers, or realtors was an effective way of arriving at the appropriate value adjustment for the presence of HVOETLs. Slightly less than 4% of appraisers said they used their own judgment to determine the effect of HVOETLs. The remaining responses were varied and in some cases unique. Examples of other techniques included: gross rent multiplier analysis, court awards, and the belief that adjustment was merited only when a property was experiencing an extended stay on the market.

Survey participants who had valued properties close to power lines were asked if there was anything further they would like to add that would help explain how HVOETLs affect appraisals of residential property. Thirty-nine appraisers provided additional insight. Twelve respondents felt that the size and placement of the structure carrying the power lines was extremely important in determining whether a property would ex-

**Exhibit 6**  
**How is the Impact of HVOETLs Measured?**

Technique Used	Percent of Respondees Citing
Matched pairs (paired sales analysis)	69.0
Public data, the market, MLS information	9.0
Discussions with buyers, sellers, developers, realtors	7.5
Appraisers' own judgment	4.0
Other	10.0

Source: Authors

perience a value loss. They said that close proximity would naturally reduce the value more than if the HVOETLs were simply visible. These statements would appear to support the Colwell study [6] which found that the magnitude of the power line effect on property value is a function of the distance and relationship of the lines to the subject property.<sup>11</sup>

Five respondents thought that new or more expensive houses were affected more by proximity to HVOETLs, but one respondent disagreed, saying that it was the cheaper houses that experienced a decline in value. Two respondents mentioned that FHA financing might not be available for houses located close to high voltage power lines. Four individuals felt that property values were affected negatively only in soft markets.

### **Perceptions Existing among Those Who Have Not Appraised Properties Proximate to HVOETLs**

An interesting finding provided by the survey is that those appraisers who have not actually done a value estimation of a property proximate to a high voltage power line feel the negative impact will be greater than the decline observed by those appraisers who have done such work. Eighteen respondents who had not appraised any residential property proximate to HVOETLs indicated that the power lines would have a negative impact on residential property value. This group estimated an average decline in value of 11.94%, as compared to 10.01% for those who had actually appraised properties adjacent to or within sight of HVOETLs.<sup>12</sup>

Responses from appraisers who had not valued any residential properties proximate to HVOETLs included comments about perceived health hazards, particularly contraction of various cancers and health risks to young children. Further, these respondents indicated they thought developers had to lower lot prices to sell these properties and that HVOETLs impact more negatively when there is an oversupply of homes. One appraiser felt that lower priced homes were not particularly affected, and another respondent noted that homes near HVOETLs often were not well maintained. Additionally, two appraisers who felt there would be a negative impact noted that the value decline is not always substantial and that many home buyers considered the lines as only a minor adverse condition. Overall, it appears from the input of respondents who had no experience with appraising residential properties proximate to HVOETLs, that they had similar thoughts and views on the issue as their colleagues who had appraised such properties.

### **Conclusions**

Results of this survey strongly suggest that the market value of residential property can be affected by proximity to high voltage power lines. It is clear from the responses of appraisers experienced in this type of appraisal assignment that affected properties are selling at a discount to comparable properties not subject to the influence of HVOETLs. This finding is in contrast to much of the research conducted to date that finds little or no impact from high voltage power lines on residential property values. Eighty-four percent of the appraisers (Appraisal Institute members with the RM designation) surveyed believe that HVOETLs reduce the value of residential property located near the

lines. Only 10% of respondents felt that proximity to the lines generated no value impact, while 6% said that proximity to the power lines increased property value.

Consequently, in most instances, appraisers are according a negative adjustment to properties bordering or within sight of HVOETLs. The range of value decline was estimated to be 0 to 50%. Based on market data, the majority of which was analyzed in the context of paired sales analysis, the mean decline in value noted by respondents who had appraised residential property subject to the influence of HVOETLs, and depending on geographic region, ranged from 7.77% to 15.5%, with the mean decline for all regions equalling 10.03%. Further, the results indicate that even appraisers who have not appraised such property believe that HVOETLs contribute negatively to property value. The estimated impact of power lines by this group of appraisers, however, was more than 19% greater than the estimate provided by appraisers who had experience with this type of appraisal (11.93% versus 10.01%).

As noted already, the results of this study conflict with the findings of the majority of studies conducted from the mid-1950s through the late '80s, which generally support the conclusion that HVOETLs have little or no impact on property value. The question begs, why is it that only the more recent research (the notable exception being Colwell and Foley [5] and Colwell [6]) suggests that HVOETLs impart a significant negative effect on residential properties? One logically would have to credit increased public awareness from recent media coverage of the potential adverse health consequences from long-term exposure to the electromagnetic fields generated by such facilities. As the public has become more aware of the possible link between power line proximity and health, this concern is being incorporated into the pricing calculus of residential home purchasers and capitalized into lower property values. Survey respondents who have appraised property proximate to HVOETLs give support to this conclusion.

More often, however, appraisers noted it is the visual unattractiveness of power lines that accounts for the value decline. This is interesting in light of recent work by Colwell [6] which found a time dimension to the penalty associated with power line proximity. Specifically, the negative impact on value diminishes over time. Ostensibly, trees and other natural elements will be planted and grow which eventually will provide effective visual buffers thereby reducing or eliminating the visual unattractiveness. The logical implication is that residential property, new or existing and currently without adequate landscaping, may suffer a one-time penalty, but this penalty may not be permanent.

Given responses to several questions, specifically 4, 10 and 16, it would appear that owners of properties proximate to HVOETLs will face increasing difficulty in selling them in the future. It will be some time yet before research definitively can say whether or not HVOETLs impose a health hazard. Should that prove true, property values, no doubt, will continue to adjust in line with the perceived risks associated with this environmental hazard. The possibility exists that, in certain instances, residential properties may become virtually impossible to market; a situation similar to that facing property owners adjacent to sites where toxic or hazardous wastes have been discovered.

### **Implications for Future Research**

Additional work is needed to clarify some of the issues revealed in this study, particularly with respect to the differential value effects noted by survey respondents.

Results strongly suggest that high voltage power lines can affect residential property value to varying degrees in certain circumstances. There remains, however, a question as to what the appropriate value measurement is for residential property due to HVOETL proximity. For example, appraisers indicated that HVOETLs may affect some residential properties and not others; the effect being a function of the relative price of the property being appraised. Whereas some appraisers claim it is only lower priced properties that suffer from proximity to high voltage power lines, other appraisers claim just the opposite—it is higher priced properties that suffer. Related issues are whether or not the value effect is proportional over all price ranges, whether or not the effects vary depending on geographic region, and the magnitude of any effect as a function of distance and relationship of the subject property to the power lines. Future research should seek to provide quantitative measures of the value impact as a function of the variables identified by survey participants.

Survey respondents who had not appraised residential property proximate to HVOETLs believe a greater negative value adjustment is warranted for this externality than appraisers who had appraised such property. While the authors believe experienced appraisers are reporting their estimates of the value impact based on market data, an important issue that is unresolved, however, is the basis by which non-experienced appraisers arrive at their estimates of the value impact. It may be that appraisers lacking experience are considering market data in estimating the impact of power lines, but not the same type of market data used by experienced appraisers. Alternatively, these estimates may be derived not through analysis of market data but through other means or may simply represent the perception of these appraiser respondents. To the extent perceptions, rather than market data, underpin the magnitude of any value adjustments, the valuation process may be suspect and open to criticism. Future research is needed to determine if the difference is statistically significant when larger samples are obtained and to determine the basis of this difference.

### Appendix

#### Valuation of Property Proximate to High Voltage Overhead Electric Transmission Lines

The purpose of this survey is to determine if valuation of single-family residential real estate is affected when it is located *proximate* to high voltage overhead electric transmission lines (HVOETLs). HVOETLs are considered *proximate* if they

1. go through or touch the subject property in any way, or
2. are within sight of the subject property.

**Instructions:** Please answer the following questions and return this form in the enclosed post-paid, pre-addressed envelope. Thank you very much for your help.

1. Do you believe market value of residential property is *negatively* affected when it is located proximate to HVOETLs? (Circle number of answer.)

- ☐ 1 YES    ➡ If yes, answer questions 2, 3 and 4, then go to 7.  
☐ 2 NO    ➡ If no, answer questions 5 and 6, then go to 7.

**If yes:**

2. How much, on the average, is property value decreased?  
       \_\_\_\_\_ %
3. What contributes to the decline in value? (Circle number(s) of answer(s) and make any additions.)
  - ☐ 1 HVOETLs are visually unattractive
  - ☐ 2 HVOETLs are unsafe
  - ☐ 3 HVOETLs give off a disturbing sound
  - ☐ 4 HVOETLs may cause health problems
  - ☐ 5 Other: (please specify) \_\_\_\_\_
4. What actions have you observed taken by builders, developers, or sellers of residential property to offset any negative effects associated with HVOETLs? (Circle number(s) and/or add actions.)
  - ☐ 1 Proximate property had a larger lot
  - ☐ 2 Proximate property had lower price
  - ☐ 3 Proximate property had buffer added, e.g., landscaping to "hide" HVOETLs
  - ☐ 4 Other: (please specify) \_\_\_\_\_

**If no:**

5. Do you believe HVOETLs have *no* impact or a *positive* impact on proximately located residential property?
  - ☐ 1 No impact
  - ☐ 2 Positive impact
6. Please explain your answer to 5: \_\_\_\_\_

7. How many residential properties have you appraised in the past 5 years? (Circle one number.)
- ☐1 None      *If you appraised no residential property within five years, go directly to question 16.*
- ☐2 Less than 50
- ☐3 50 to 100
- ☐4 101 to 150
- ☐5 151 to 200
- ☐6 Over 200
8. What percentage of the residential properties that you appraised were located proximate to HVOETLs? (Circle one number.)
- ☐1 None      *If you appraised no residential property proximate to HVOETLs within five years, go directly to question 16.*
- ☐2 Less than 10%
- ☐3 10% to 20%
- ☐4 21% to 30%
- ☐5 31% to 50%
- ☐6 Over 50%
9. How do you measure the effect of HVOETLs on residential property values? Specifically, what appraisal methods or data sources do you rely on to obtain an accurate measure of the value increase/decrease attributed to HVOETLs?
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
10. Is there anything you could add to your answers in questions 2–6 that would help explain further how HVOETLs affect your appraisals of residential property?
- ☐1 Yes      (please specify) \_\_\_\_\_
- ☐2 No      \_\_\_\_\_
- \_\_\_\_\_
11. How many years have you been in the appraisal business?
- ☐1 Less than 5 years
- ☐2 5 to 10 years
- ☐3 11 to 15 years
- ☐4 More than 15 years
12. What percentage of your billable time is spent on residential appraisals? \_\_\_\_\_ %
13. Please list the professional appraisal designations that you presently hold.
- \_\_\_\_\_
14. In what state(s) do you do most of your appraisals?
- \_\_\_\_\_
15. Please list the major electric utility companies serving the area(s) where you do the majority of your appraisals.
- \_\_\_\_\_
16. Add any other comments about how HVOETLs affect the valuation of residential property.
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

## Notes

<sup>1</sup>The definition of proximate property as being either adjacent to or within sight of power lines is consistent with the definition found in Kinnard [17] and the majority of studies cited in that work.

<sup>2</sup>From the title and annotation, the Brown study would appear to be misclassified.

<sup>3</sup>Colwell reports that the sales price of residential property increases at a decreasing rate up to about 200 feet from the power lines. Beyond this point no measurable impact is observed.

<sup>4</sup>Again, the Realty Research Group Ltd. study would appear to be misclassified in Kinnard's bibliography [17].

<sup>5</sup>The survey was conducted with members of the American Institute of Real Estate Appraisers. On January 1, 1991, the American Institute of Real Estate Appraisers and the Society of Real Estate Appraisers unified to form the Appraisal Institute.

<sup>6</sup>The sample size required to establish a 95% confidence level on the data with no more than a 5% error was determined using the sample size formula found in Zuwaylif [20]. The formula is:  $n = ((z)^2(p)(1-p))/e^2$ , where  $n$  = the required sample size,  $z$  = the degree of confidence that the error in the estimate does not exceed the maximum allowable error,  $p$  = the estimate of population proportion, and  $e$  = the magnitude of the maximum allowable error. Letting  $z = 1.96$ ,  $e = .05$ , and  $p = .133$ , and solving for  $n$  yields a sample size of 177.

<sup>7</sup>Other designations held included the: SRA, SREA, SRPA, CRA, GRI, CAE, IFAS, and IFA.

<sup>8</sup>This estimate is based on the input of all survey respondents whether or not they had actually appraised property subject to the influence of HVOETLs.

<sup>9</sup>It is not clear to the authors that the respondents who mentioned burial of transmission lines were clear on what constitutes high voltage transmission lines. While residential electrical service is commonly underground, and in many areas is required by code or deed restrictions to be underground, high voltage lines, according to several major electric utilities, are almost always above ground, and they cite cost considerations as the major reason.

<sup>10</sup>The authors acknowledge the observation of an anonymous referee that question 9 in the Appendix, is worded in such a way that responses may be interpreted either as reporting what method appraisers did use in estimating the impact of HVOETLs or what method they would have preferred to use. Given the question was asked only of appraisers with experience appraising residential property subject to high voltage power lines, we believe they reported the methods they actually used to determine the value impact. We recognize, however, that this is our opinion and cannot be proved conclusively in the context of the survey.

<sup>11</sup>As noted by an anonymous referee, the survey questionnaire was not designed to elicit responses sufficient to yield interpretable estimates of the HVOETL effect on residential property value, i.e., specific estimates of the value impact as a function of distance or relationship of the lines to the subject property.

<sup>12</sup>Statistical tests were conducted to determine if the difference in the sample means was different from zero. While the statistics were such that the null hypothesis could not be rejected at any reasonable level of significance, further research may be warranted to ascertain if, in fact, a statistical difference exists when larger samples are obtained.

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